Georgia Department of Transportation

Construction Engineering Inspection Training

Pavements Inspection—Group 2

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Pavements Inspection

Section 400: Hot Mix Asphaltic Concrete Construction

Definitions

Segregated Mixture: Mixture lacking homogeneity in HMA constituents of such a magnitude that there is a reasonable expectation of accelerated pavement distress or performance problems

New Construction: A roadway section of more than 0.5 mile (800 m) long that is not longitudinally adjacent to the existing roadway

Trench Widening: Widening no more than 4 ft (1.2 m) in width

Comparison Sample: Opposite quarters of material sampled by the Contractor

Independent Sample: (Also called Quality Assurance Sample) A sample taken by the Department to verify an acceptance decision without regard to any other sample that may also have been taken to represent the material in question

Referee Sample: A sample of the material retained during the quartering process that is used for evaluation if a comparison of Contractor and Departmental split sample test results is outside allowable tolerances

Paving Plan

- Include the following on the paving plan:
  - Proposed starting date
  - Location of plant(s)
  - Rate of production
  - Average haul distance(s)
  - Number of haul trucks

- Paver speed, ft (m)/min, for each placement operation
- Mat width for each placement operation
- Number and type of rollers for each placement operation
- Sketch of typical section showing the paving sequence for each placement operation
- Electronic controls used for each placement operation
- Temporary pavement marking plan

Job Mix Formula

- Include the following in the job mix formula:
  - Specific Project for which mixture will be used
  - Source and description of materials
  - Mixture ID number
  - Proportions of raw materials to be combined in the paving mixture
  - Single percentage of combined mineral aggregates passing each specified sieve
  - Single percentage of asphalt by weight of total mix
  - Single temperature of discharged mixture from plant
  - Theoretical specific gravity of mixture
  - Name of person/agency responsible for quality control

Vehicles for Transporting Mixtures

- Use a required approved releasing agent (QPL 39) for transporting vehicle beds
- Ensure the releasing agent is not detrimental to mixture
- Protect the mixture with waterproof cover that extends over the sides and ends of the bed
- Insulate the front end and sides of each bed with an insulating material
- Mark each transporting vehicle with a clearly visible identification number
- Create a hole in each side of the bed so that the temperature of the loaded mixture can be checked

Equipment Cleaning

- Provide sufficient hand tools and power equipment to clean the roadway surface before placing the bituminous tack coat

Bituminous Paver Requirements

- Ensure the paver meets the following requirements:
  - Capable of maintaining true to line, grade, and cross section
  - Smooth, uniform in density and texture
  - Continuous line and grade reference control
  - Automatic screed control system
  - Transverse slope controller
  - Screed control
  - Spreads and finishes courses to place hot mix asphaltic concrete
  - Automatic grade sensing and slope control
  - Automatic dual grade sensing
  - Combination automatic and manual control
  - Total manual control
  - Paver screed extension

Do not use extendable strike-off devices instead of approved screed extensions. Only use a strike-off device in areas that would normally be fixed by hand

Compaction Equipment

Ensure that the compaction equipment is in good mechanical condition and can compact the mixture to the required density

Material Transfer Vehicle (MTV)

Use an MTV to place asphaltic concrete mixtures on Projects on the State route system with the following conditions:

- ADT is equal or greater than 6000
- Project length is equal to or greater than 3000 linear feet (915 linear meters)
- Total tonnage (megagrams) of mixture is greater than 2000 tons (1815 Mg)

Use an MTV in the following locations:

- Mainline of the traveled way
- Collector/distributor (C/D) lanes on Interstates and limited-access roadways
- Leveling courses at the Engineer's discretion

Do not use the MTV for the following conditions:

- Resurfacing project that only 9.5 mm mix is required
- A project with lane width that is equal to or less than 11 feet
- A passing lane project

Existing Surface Preparation

- Clean the existing surface to the Engineer's satisfaction before applying hot mix asphalt concrete on pavement
- Patch and repair minor defects (potholes and broken areas)
- Apply bituminous tack coat using a pressure distributor

Place Patching and Leveling Course

- Bring the surface area to the proper cross section and grade with a leveling course of hot mix asphaltic concrete materials, when the existing course is irregular
- Place leveling at locations and in amounts directed by the Engineer
- For leveling courses, use a motor grader equipped with a spreader box and smooth tires

Provide the Engineer at least 1 day's notice prior to beginning construction

Construction

- Determine the course's maximum compacted layer thickness by type of mix being used
- Do not mix and place asphaltic concrete if the existing surface is wet or frozen
- Unload the mixture into the paver hopper or into a device designed to receive mixture from delivery vehicles
- Spread the mixture to a loose depth for compacted thickness or spread rate except for leveling courses
- Use a mechanical spreader true to line, grade, and cross section specified
- Obtain the Engineer's approval for sequence of paving operations
- Minimize tracking tack onto the surrounding surfaces, including paving the adjoining lanes
- Perform night work with artificial light provided by the Contractor
- Ensure outside edges of pavement being laid are aligned and parallel to centerline
- Remove and replace the mixture placed on roadway that the Engineer determines is unacceptable
- Continue rolling until roller marks are no longer visible

- For new construction and resurfacing containing multiple lifts and courses, arrange the width of individual lifts so that longitudinal joints of the successive lift offsets 1 ft from the previous lift

Environmental Note: Do not use fuel oil or other harmful solvents to clean tools during work

Pavement Protection

- Protect sections of newly finished pavement from traffic until traffic will not mar the surface or alter the surface texture
- Use artificial methods to cool the newly finished pavement to open pavement to traffic more quickly (if directed by the Engineer)

Quality Acceptance

- The Contractor will randomly sample and test mixtures for acceptance on a lot basis
- The Department will monitor the Contractor testing program and perform comparison and quality assurance testing

Payment

Item	Payment Method
Hot Mix Asphaltic Concrete	Contract Unit Price per ton (megagram) or per square yard (meter)

Related References

Section	Title
106	Control of Materials
109	Measurement and Payment
152	Field Laboratory Building
413	Bituminous Tack Coat
424	Bituminous Surface Treatment
802	Aggregates for Asphaltic Concrete
828	Hot Mix Asphaltic Concrete Mixtures
315	AASHTO
209	AASHTO
202	AASHTO
49	AASHTO

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Section 401: Cold Mix for Patching

General

This section contains requirements for a mixture of mineral aggregates and cutback asphalt suitable for short periods of stockpiling

Composition of Mixtures

- Ensure bituminous cold mixtures are uniform mixtures of aggregate, asphaltic material, and mineral filler, if required

Mixture Stockpiles

- Place finished mixture in small stockpiles to allow proper curing
- After curing, stockpile the mixture in one large stockpile, if possible
- Ensure the stockpile area is clean and well drained

Payment

- Cold mix is paid at the Contract Unit Price per ton (megagram) (see the entire payment section for more information)

Related Specifications

Section	Title
800	Coarse Aggregate
802	Aggregates for Asphaltic Concrete
820	Asphalt Cement
821	Cutback Asphalt
824	Cationic Asphalt Emulsion

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Section 402: Hot Mix Recycled Asphaltic Concrete

Definition

Asphalt RAP: Asphalt Reclaimed Asphalt Pavement and other components (See Standard SPEC PG 304)

Location of Department RAP material stockpiles is given on the plans

Requirements

- Do not use RAP material that contains alluvial gravel or local sand in any mixture placed on Interstate Projects
- See Section 402.1.03 concerning removal of RAP from a stockpile
- Contractors require the submission of an affidavit to the GDOT Materials Testing Laboratory (see Section 402.1.03B)
- On interstate projects, limit RAP materials that contain alluvial gravel or local sand to shoulder construction
- Asphaltic concrete removed from an existing roadway becomes the Contractor's property unless specified otherwise
- Stockpile RAP at a location specified on the plans
- Ensure that recycled mixture is a homogeneous mixture of RAP or RAS material, virgin aggregate, hydrated lime, and neat asphalt cement
- Erect a sign on each stockpile to identify its source(s)
- The Department may reject by visual inspection stockpiles that are not free of foreign materials

Payment

- RAP materials are paid at the Contract Unit Price per ton (megagram) (see Section 402.5.D for detailed Payment and Measurement information)

Related Specifications

Section	Title
800	Coarse Aggregate
828	Hot Mix Asphaltic Concrete Mixtures

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Section 403: Hot In-Place Recycled Asphaltic Concrete

Construction

Follow these steps for hot in-place recycling of the existing surface:

- Soften the existing surface with heat
- Use hot milling to obtain the depth shown in the plan typical section or stated in the Contract
- Apply the tack coat
- Apply the rejuvenating agent
- Add plant-produced asphaltic concrete and virgin aggregate prior to remixing
- Thoroughly remix, level, and relay the recycled mixture

Materials

Material	Specifications
Aggregate	• Add virgin aggregate from an approved source • Use stone size and spread rate specified in the plans
Plant-Produced Hot Mix Asphaltic Concrete	• Add type and amount of plant-produced asphaltic concrete • Allow addition of additional on mixture design analysis
Asphalt Cement Rejuvenating Agent	• Obtain approval from the Office of Materials for source, amount, and type of agent used • Allow addition of additional on mixture design analysis
Bituminous Tack Coat	• Apply with a system equipped with positive start/stop capabilities that prevent tack puddles and uniformly distribute across the full width of the surface being recycled
Asphalt Modifier	• Add at dosage rate specified in the plans • Obtain approval by the OM prior to use in work

Notes:

- Allow the Department 2 weeks to verify the mix design after receiving the proposed mix design and material
- Do not begin recycling operations until the Department has approved the design and accepted the mixture

Equipment (see Specification 403.3.02 A-D)

Material	Information
Heating and Milling Units	• Capable of heating asphalt concrete pavement to a temperature high enough to remove excess moisture and allow hot milling
Blending Unit	• Capable of blending the removed material and the rejuvenating agent into a homogeneous mixture
Screed	• Capable of collecting and distributing recycled mixture over variable widths for the entire width being processed
Auxiliary Equipment	• Provide suitable surface-cleaning equipment, hand tools, rollers, and others to perform the work

Surface Preparation

- Clean the surface so as to be free of dirt, vegetation, and other objectionable materials immediately prior to the affected areas being recycled
- Remove all metal raised pavement markers
- Remove thermoplastic paint markings prior to recycling

Heat, Remove, and Blend Materials

- Evenly heat pavement at a full lane width 3-in. (75 mm) minimum overlap onto adjacent pavement materials
- Control heating to ensure uniform penetration without differential softening of surface
- Distribute virgin aggregate across the entire width being recycled prior to the last head application

Ensure the final blended mix in the windrow is uniform

- Hot mill and rework pavement to the width and depth shown in Play typical section
- Control the width of each pass to provide proper longitudinal joint placement
- Ensure the milled material is heated sufficiently to be free of lumps
- Do not use scrapers, scarifiers, or mechanical means of removing softened pavement other than milling heads
- Ensure the aggregate is consistently coated
- Ensure there is no evidence of broken or fractured aggregate in the windrowed material
- Review Section 403.3.05.C for detailed tack coat information

Application

- Control placement of the mixture to produce a surface true to line, grade, and cross slope with a uniform surface texture free of segregation, lumps, or other unacceptable streaks
- Ensure the mixture meets acceptance requirements for mixture quality, compaction, smoothness, and thickness
- Overlay recycled mixture by producing and placing mixture that meets requirements
- Review Section 403.3.06 for Quality Acceptance information

Payment

- Hot in-place recycled asphaltic concrete is paid at the Contract Unit Price per square yard (meter) (see Specification for more detailed payment information)

Related Specifications

Section	Title
800	Coarse Aggregate
828	Hot Mix Asphaltic Concrete Mixtures

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Section 405: Hot Asphalt–Vulcanized Rubber Seal Treatment

Materials

- *Asphalt Cement*: Before adding rubber and diluent, ensure the asphalt cement conforms to the required specifications
- *Ground Vulcanized Tire Rubber*: Ensure ground vulcanized tire rubber meets the required specifications
- *Diluent*: Use kerosene with a boiling point above 350°F (175°C)
- *Coarse Aggregate*: Ensure the gradation of cover aggregate meets the specification (Section 800) for No. 7 Stone

Equipment

Type	Information
Canvas Cover	Cover exposed material with canvas to help prevent the temperature of exposed material from dropping
Aggregate Spreader	Use an adjustable, self-propelled aggregate spreader to accurately spread amounts given in the plans
Rubber Tire Rollers	Use at least 3 rubber tire rollers loaded to 5000 lb (2275 kg) per tire

Construction

Mixing

- Before adding rubber, ensure the asphalt temperature is no higher than 325°F
- Rapidly combine the rubber with the asphalt
- Mix the rubber until the material approaches a semi-fluid consistency
- Mix the hot asphalt and the rubber for at least 5 minutes

> Ensure the mixing equipment can produce a homogeneous mixture of rubber and asphalt to prevent separation

Spreading

- Immediately begin application when proper consistency is reached
- Never hold the mixture at temperatures over 325°F (160°C) for more than 1.5 hours

Placement

- Place the hot asphalt–rubber mixture only when the ambient temperature is 60°F (15°C)
- Perform at least 4 coverage with the pneumatic rollers
- Roll immediately after application
- Do not permit traffic on the completed surface until approved by the Engineer
- Sweep joint edges clean of overlapping cover aggregate
- Avoid skips and overlaps at joints and protect the surface of adjacent structures
- Use building paper for transverse joints

Payment

- Accept quantity of seal treatment is paid at the Contract Unit Price per square yard (meter)

Related Specifications

Section	Title
413	Bituminous Tack Coat
424	Bituminous Surface Treatment
800	Coarse Aggregate
820	Asphalt Cement

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Section 407: Asphalt-Rubber Joint and Crack Seal

Definitions

Type M: Used to fill joints and cracks in portland cement concrete or asphaltic concrete pavements when required

Type S: Used to seal joints and cracks in portland cement concrete and asphaltic concrete pavements and shoulders

Materials

- Ensure the mixture contains no water or volatile solvents and cures immediately when cooled to sufficient viscosity to prevent tracking caused by traffic
- Ensure the plastic film used to package units melts at normal application temperatures when placed in installation equipment

Equipment

Type	Information
Field Installation	• Must produce or maintain the specified temperatures even if filled to capacity
Crack Filling	• Seals large cracks from the bottom up • Must fill joints and cracks by directing sealant into the crack
Air Compressor	• Must be considered satisfactory to the Engineer

Preparation

- Use compressed air to clean joints and cracks to be sealed
- Clean the pavement surface and check joints/cracks to ensure they are free of vegetation, dirt, dust, moisture, and other foreign material

Construction

- Do not seal joint cracks if rain is imminent or if air temperature is below 35°F (2°C)
- Place prepackaged sealant mixture in field installation equipment

Apply the mixture at specified application temperature according to the manufacturer's recommendations

- Heat sealant mixture for the proper time/temperature to provide full reaction between the asphalt and rubber
- Fill joints and cracks slightly overfull

Payment

- Asphalt-rubber joint and crack seal is paid at the Contract Unit Price bid

Related Specifications

Section	Title
AASHTO	PP5
ASTM	D 4
ASTM	D 36
ASTM	D 3407
ASTM	D 3583

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Section 411: Asphaltic Concrete Pavement, Partial Removal

Sawing the Joint

Saw the joint as follows:

- True to lines shown in the plans or as directed by the Engineer
- To the full depth of the existing asphaltic concrete, unless directed otherwise
- Leave a neat, vertical face for the full depth of the retained portion

Pavement Removal

- Begin removing isolated pavement after sawing the joints
- Use removal methods that will not damage the pavement edges
- Leave a neat, vertical face for the full depth of retained portion

Protection of Remaining Edges

- Do not allow traffic or equipment to cross the remaining edges
- Repair or restore damaged edges to the Engineer's satisfaction

Related Specifications

Section	Title
205	Roadway Excavation

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Section 412: Bituminous Prime

Construction

- Use the following equipment:
  - Pressure distributor
  - Power broom and blower
  - Aggregate spreader
  - Pneumatic-tired roller
- Do not apply prime when the surface is wet, rain is imminent, or the air temperature is below 40°F
- Apply prime to the full width of the proposed wearing surface
- Prime the following areas:
  - Cement- or lime-stabilized bases or subbases, regardless of pavement thickness
  - Soil or aggregate bases or subbases on which bituminous surface treatment will be laid
  - Soil or aggregate bases or sub-bases on which less than 5 inches total thickness of hot mix asphaltic concrete will be placed
  - ***Not*** on driveways or paved shoulders

Surface Conditions

- Ensure the surface is finished to the line, grade, and cross section specified
- Ensure it is uniformly compacted and bonded
- Remove loose material, dust, caked clay, and other material from the road

Surface irregularities of existing pavement must be corrected

Protection, Curing, and Maintenance

- Close the roadway to traffic
- Roll the surface longitudinally with a pneumatic-tired roller
- Blot sand to the tack places to ensure the tack is not lifted by the equipment
- Open the roadway to traffic after rolling and sanding

Related Specifications

Section	Title
821	Cutback Asphalt

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Section 413: Bituminous Tack Coat

Emulsified Asphalt

- Maintain equipment for delivery, storage, and handling of emulsified asphalt to prevent contamination
- Transfer emulsified asphalt directly to the pressure distributor from the transport tanker
- Provide and maintain temperature-measuring devices to monitor during storage (do not allow the asphalt to freeze)

> Provide the following equipment: Power broom and blower, pressure distributor, and a dedicated pressure distributor

Application

- Clean the area before applying the tack coat
- Coat the entire areas to be paved with tack coat, unless directed otherwise by the Engineer
- Apply tack coat with distributor spray bars
- The Engineer will determine the application rate of the bituminous tack coat

- Apply only enough tack coat that can be covered with a new pavement course the same working day
- After application, allow the tack coat to break and become tacky
- Do not allow traffic to travel on the tack coat

Payment

- Bituminous material is paid at the Contract Unit Price per gallon (liter)

Related Specifications

Section	Title
109	Measurement and Payment
820	Asphalt Cement
822	Emulsified Asphalt
824	Cationic Asphalt Emulsion

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Section 424: Bituminous Surface Treatment

Definitions

Single Surface Treatment:	One application of bituminous material that is covered with aggregate
Double Surface Treatment:	A bituminous material application that is covered with aggregate of the size specified in the proposal followed by a second bituminous material application that is covered with a second specified size aggregate
Triple Surface Treatment:	A bituminous material application that is covered with a specified size aggregate followed by subsequent applications of bituminous material that are covered with successively smaller sized nominal aggregates

Materials

Type	Information
Bituminous Material	• Select from any type and grade listed in the materials list • Notify the Engineer 10 days before ordering the material
Aggregates	• Size and group are specified in the Proposal • Do not use unconsolidated limerock unless otherwise specified • Use Class B aggregates only where surface treatment is used for shoulder construction

Equipment

Type	Information
Aggregate Spreader	• The Department will annually inspect the spreader before use in the work • Use a self-propelled spreader that can apply aggregate at the desired rate uniformly and accurately without corrugation, overlaps, or excess deficient areas • Provide spreaders that cover the full width of asphalt application
Pressure Distributor	• Mount the distributor on pneumatic tires wide enough to prevent damage to the road surface • Design, equip, maintain, and operate so that material is heated and applied evenly throughout the length of the spray bars • Ensure it maintains constant, uniform pressure on the nozzles • Install screens between the tank and the nozzles and clean them frequently
Heating Equipment	• Ensure it will heat and maintain bituminous material uniformly at the required temperature
Steel-Wheeled Rollers	• Use self-propelled, tandem-type steel-wheeled rollers • Use rollers that weigh 3–8 tons (3–7 Mg) • Ensure it properly seats aggregate without fracturing the aggregate particles • Equip the roller drums with scrapers to prevent pickup of material
Pneumatic-Tired Rollers	• Use self-propelled, two-axle rollers with smooth-tread rubber tires aligned such that no gaps exist on the finished surface • Equip with scrapers and scrubbers to prevent pickup of material
Power Broom and Blower	• Provide one (minimum) of each of a combination that can remove dust or lose material from the road surface

Firmly compact, finish, and prime new bases

Removing Foreign Material

- Use power brooms, power blowers, hand brooms, or other means to remove loose material, dust, dirt, clay, and other materials
- Take special care to clean the outer edges thoroughly
- Use motor grader blade to remove excess material off the paving edge

Condition of Prime

- Ensure prime is cured before placing the mat course
- Require prime if the existing surface is loose, soft, not bonded, removed, or damaged
- Remove concentrations of excess prime
- Perform additional rolling with pneumatic-tired roller as directed

Apply bituminous surface treatment when:

- The date is between April 15 and October 15
- Ambient temperature has ***not*** been less than 45°F (7°C) for 48 hours immediately prior to application
- No forecast is for ambient temperature less than 45°F (7°C) for 48 hours immediately following application
- Ambient temperature and road surface temperature are at least 60°F (16°C) and stable at the time of application

Construction

- After application of the bituminous material, immediately cover that with an application rate of aggregate before beginning the next section
- Do not apply the bituminous material to the full width of the pavement unless the aggregate spreader can immediately cover it
- Never allow bituminous material to chill, set up, dry, or reach a condition that impairs the retention of cover aggregate before application

Spreading Aggregates

- Ensure that aggregates do not contain free moisture when spread
- Apply aggregate immediately after applying bituminous materials
- Uniformly spread the aggregate at the specified rate
- Move the spreader at a uniform speed regardless of the grade
- Ensure the distance of aggregate free fall remains constant during spreading
- Remove corrugations
- Ensure a uniform aggregate spread by hand spotting and brooming

Rolling

- Synchronize the speed of the distributor and aggregate spreader with the rolling operation
- Use a minimum of 2 individual rollers, one of which must be a pneumatic-tired roller
- Use pneumatic-tired rollers only if the steel-wheeled roller fractures the aggregate
- Begin rolling within 1 minute after spreading the aggregate
- Operate rollers at speeds not exceeding 5 mph
- Proceed in a longitudinal direction, beginning at the outside edge of the aggregate application
- A roller pass is defined as one trip in a single direction
- Overlap each roller pass by approximately half the roller width
- Provide a minimum of three (3) roller passes per roller for each layer of aggregate

A roller pass is defined as one trip in a single direction

Brooming

- Use a revolving broom as necessary to redistribute excess stone
- Sweep the surface treatment within the first 3 hours of the next available workday following placement
- Do not unseat bonded stone when sweeping

Traffic Control

- Do not allow traffic on the surface treatment until the bituminous material has cured sufficiently
- Control traffic to speeds not exceeding 25 mph for a minimum of 2 hours after application

Payment

- Surface treatment is paid at the Contract Unit Price per square yard (meter)

Related Specifications

Section	Title
105	Control of Work
800	Coarse Aggregate
802	Aggregates for Asphaltic Concrete
820	Asphalt Cement
824	Cationic Asphalt Emulsion

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Section 427: Emulsified Asphalt Slurry Seal

Slurry Seal Design

- Submit design samples of each ingredient to be used 2 weeks before the beginning of work
- Include sample information (source, type, and Project number)
- Slurry seal work until the OMR has approved the slurry mix design
- Furnish the Engineer with calibration of the slurry mixing equipment

Materials

Type	Information
Aggregates	• Group II, Class A or B crushed stone or slag with sand equivalent • Must arrive uniform and not require blending or premixing at the site storage area
Water	• Clear and free of oil, salt, acid, alkali, organic, and other harmful substances • The Engineer may require OMR evaluation before work begins
Mixture Composition	• Uniform mixture of aggregate, emulsified asphalt, mineral filler, and water

Asphalt emulsion will not be accepted if transporting vehicles have leaked or spilled during transit

Slurry Mixing Equipment

- Use caution when mixing to ensure the emulsion does not set up prematurely
- Pre-wet aggregate and mineral filler in the machine immediately before mixing
- Use a mechanical squeegee spreader with flexible strike-off that contacts the surface
- Use a spreader equipped with augers, a steering device, and a device to adjust coverage width
- Keep the spreader box clean and free of asphalt and aggregate build-up
- Thoroughly clean cracks in the existing surface
- Remove loose material, silt spots, vegetation, and other objectionable material

Weather Note: Do ***not*** apply slurry seal if the pavement or ambient temperature is below 55°F

Tack Coat Application Steps

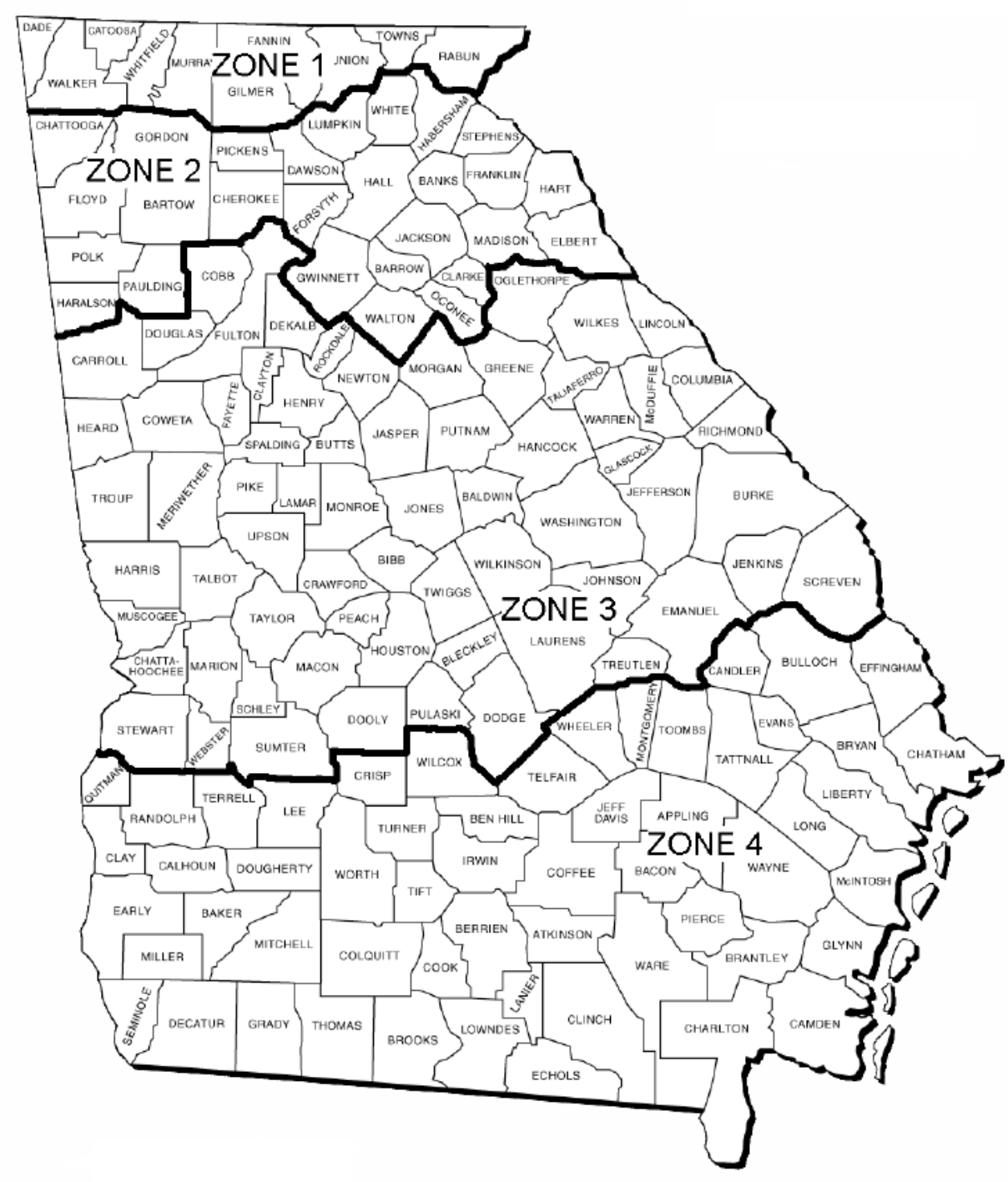
- Apply with the same asphalt emulsion type and grade as used in the slurry seal
- Use an asphalt distributor
- Apply at the application rate specified by the Engineer
- Do not deposit slurry mixture that is not the desired consistency

Traffic Control Note: Do not allow traffic on slurry seal until it has cured enough to withstand marring and tearing

Application Zones and Dates

Dates allowed for application of slurry seal:

Zone	Dates
1	April 15–October 1
2	April 10–October 25
3	April 1–October 31
4	April 1–October 31



Payment

- Emulsified asphalt slurry seal is paid at the Contract Price per square yard (meter)

Related Specifications

Section	Title
413	Bituminous Tack Coat
802	Aggregates for Asphaltic Concrete
822	Emulsified Asphalt
824	Cationic Asphalt Emulsion
830	Portland Cement
882	Lime
883	Mineral Filler

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Section 428: Microsurfacing

The maximum test temperature shall not exceed 350°F and the duration shall not exceed 20 minutes

Aggregate Storage

- Store in a manner to prevent segregation, mixing of various materials or sizes, and contamination with foreign materials
- Do not use construction equipment on, or to ramp stockpiled aggregate
- Place aggregate over a scalping screen immediately before transferring to the microsurfacing mixing machine

Bituminous Storage

- Ensure storage meets the requirements of the production rate
- Always keep clean all of the equipment used

Construction

- Produce a finished microsurfacing that has a uniform texture free from excessive scratch marks, tears, or other surface irregularities
- Ensure the cured mixture fully adheres to the underlying surface
- The Engineer may reject any work due to poor workmanship, loss of texture, raveling, or apparent instability
- Ensure the ambient temperature is at least 50°F
- Ensure the weather is not foggy or rainy
- Thoroughly clean all cracks and area to be surfaced before applying mixture

Application

- Pre-wet the surface by spraying water ahead of and outside the spreader box
- Spread the paving mixture on the prepared surface to produce a uniform finished surface
- Fill ruts to restore the designed profile of the pavement cross section
- Do not permit excess crowning or overfilling of the rut area
- Carry a sufficient amount of material in the spreader box to ensure complete coverage
- Provide a smooth, neat seam where two passes meet
- Immediately remove excess material from the ends of each run

Do not allow traffic on the microsurfacing mixture until it is cured sufficiently to prevent pickup or marring of the surface

Payment

- Microsurfacing is paid at the Contract Price per square yard (meter) or per ton (megagram)

Related Specifications

Section	Title
412	Bituminous Prime
424	Bituminous Surface Treatment
824	Cationic Asphalt Emulsion

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Section 429: Rumble Strips

Construction

- Use nonvibrating hand rollers to compact the strips
- Ensure the form confines and spaces the hot mix according to the plan details

Follow this procedure:

- Tack the entire 20-ft (6 m) strip length
- Place the oiled form, and ensure the first strip coincides with the beginning of the first unit
- Place and level the plant mix
- Roll the strips with the forms in place to the Engineer's satisfaction

> Do not place strips on wet or frozen pavement

Payment

- Rumble strips are paid at Contract price per each

Related Specifications

Section	Title
400	Hot Mix Asphaltic Concrete Construction
413	Bituminous Tack Coat

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Section 430: Portland Cement Concrete Pavement

Equipment

Type	Requirements
Scales	• Engineer will inspect and approve scales to weigh concrete materials and devices to measure water
Paving Equipment	• Must have rubber-tired wheels or flat steel wheels • Must wait to operate concrete or shoulder paving until the slab is 14 days old or has 2500 psi compressive strength • May be either slipform or fixed form
Surface Finish Equipment	• Use mechanical equipment to produce surface finish of mainline and transverse plastic concrete grooving • Ensure equipment uses rectangular-shaped steel tines of the same size and uniform length
Mechanical Sprayers	• Provide fully atomizing spraying equipment with tank agitator to place curing compounds

Store aggregate from different sources in separate stockpiles

Preparation

- Prepare the full width of subgrade and subbase according to the plans and specifications
- Ensure the surface immediately under the concrete pavement allows proper pavement thickness and yield
- Trim high areas to the proper elevation
- Ensure the subbase can support the paving equipment without rutting or bogging

Construction

- Combine authorized portions of materials in batches to produce Portland cement concrete according to specifications
- Compact the foundation under forms true to grade
- Set the form so that it firmly contacts the foundations for the entire length at the specified grade
- Prevent the forms from settling or springing under the finishing machine
- Clean and oil the forms before placing the concrete
- Provide dowel bars at the transverse joints

Concrete Placement

- Unload concrete into an approved spreading device and mechanically spread it on grade
- Place the concrete continuously between the transverse joints without using intermediate bulkheads
- Hand spread with shovels (not rakes)

> Do not allow personnel to walk in freshly mixed concrete with shoes coated with dirt or other materials

- Thoroughly consolidate concrete against the faces of the forms and along the full length and sides of the joint assemblies
- Ensure vibration does not puddle or cause grout accumulation on the surface
- Deposit concrete near formed joints
- Dump or discharge concrete only in the center of the joint assembly
- Take air and slump determination tests at a rate of at least three of each test, evenly distributed during the workday

Place Reinforcement

- Do not insert lane tie bars in the unsupported sides of the fresh concrete
- Ensure the steel placement method does not damage or disrupt the concrete
- Use bent lane tie bars if needed in the longitudinal formed joints construction

Consolidation and Finish

- Perform vibration for the full width and depth of the pavement
- Do not allow vibrators to misalign load transfer devices, or contact forms or base

- Ensure the vibrator amplitude is within the manufacturer's recommendations
- Stop the vibration when the machine cannot go forward
- Obtain uniform consolidation and density throughout the pavement
- Smooth and true the concrete using a float or finishing machine to minimize or eliminate hand finishing
- Perform hand finishing only during irregular dimension areas or if the mechanical equipment does not function after the concrete has been deposited
- Ensure the pavement surface final finish is true to grade, uniform in appearance, and free of irregular, rough, or porous areas
- Use mechanical equipment to produce a surface finish of transverse plastic concrete grooving for the mainline ramps

Forms Removal

- Do not remove forms from freshly placed concrete until it has set for at least 12 hours
- Do not allow vibrators to misalign load transfer devices, or contact the forms or base
- Remove forms carefully to avoid damaging the pavement
- Immediately cure the sides of the slab after the forms are removed
- Remove and replace major honeycombed areas

Joints

Type	Requirements
Longitudinal	• Use unpainted and uncoated deformed steel bars that are the size and length specified on the plans • Place the bars perpendicular to the joint using a mechanical device, or rigidly secure the bars in place with supports
Longitudinal Formed	• Construct while the concrete is in a plastic state • Use methods and equipment that locate joint reinforcement properly without disruption
Longitudinal Sawed Joints	• Cut with a mechanical saw within 3 days after the concrete is placed and before traffic or equipment enters the pavement
Transverse Joints	• Consists of construction joints, contraction joints, or expansion joints at the required locations • Construct in partial width/adjoining lanes to abut to the adjacent lanes • Ensure joints in plain Portland cement concrete requiring load transfer devices contain either plastic-coated or epoxy-coated dowels • Secure the dowel bars with supporting assemblies before placing the concrete
Construction	• Construct asphalt pavement when interrupting concreting operations for more than 1 hour • Do not construct within 10 ft (3 m) of an expansion joint, contraction joint, or transverse plane of weakness • Form by securing in place a removable bulkhead or header board • Place the board so that it conforms to the full cross section of the pavement • Secure it flush with the subbase and parallel to normal transverse joints
Contraction	• Create planes of weakness in plain Portland cement concrete pavement by cutting joints in the pavement surface • Saw transverse joints before the pavement cracks • Begin sawing when the concrete has hardened enough to prevent surface raveling (4 hours after placement) • Continue sawing day and night regardless of weather conditions
Expansion	• Form by securing a removable bulkhead that conforms to the full cross section of the pavement • Use bulkheads that can construct a vertical expansion wall without offsets, indentations, or burrs • Use expansion joint filler required by the plans • Furnish and install preformed joint filler in lengths equal to the pavement width or the width of one lane • Do not use damaged or repaired joint fillers

Open to Traffic

- Wait to open the pavement slab to traffic until the concrete is 14 days old or representative compressive tests show that the slab has a compressive strength of 2500 psi
- Cure compressive test specimens used for the traffic opening as near as possible to the roadway
- Erect and maintain barricades
- Assign employee watchmen to block traffic from the newly constructed pavement for the period required in this specification
- Arrange barriers away from public traffic on the lanes remaining open
- Maintain signs that clearly indicate the lanes open to public traffic
- Repair or replace pavement damaged by traffic or other causes before Final Acceptance

Payment

- Concrete pavement is paid at the Contract Unit Price per square yard (meter)

Related Specifications

Section	Title
106	Control of Materials
152	Field Laboratory Building
500	Concrete Structures
800	Coarse Aggregate
801	Fine Aggregate
830	Portland Cement
831	Admixtures
832	Curing Agents
833	Joint Fillers and Sealers
853	Reinforcement and Tensioning Steel
880	Water
886	Epoxy Resin Adhesives

Georgia Department of Transportation Construction Engineering Inspection Training

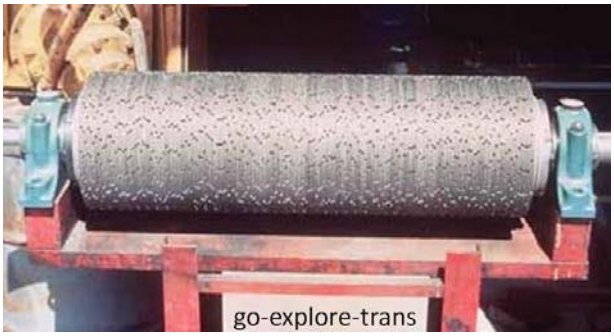
Pavements Inspection

Section 431: Grind Concrete Pavement

Grinding Equipment

Use power-driven, self-propelled grinding equipment that has:

- Diamond blades designed to smooth and texture Portland cement concrete pavement
- An effective wheel base of at least 12 ft (3.6 m)
- Pivoting tandem bogey wheels at the front of the machine
- Rear wheels arranged to travel in the track of the freshly cut pavement



Operates without encroaching on traffic movement outside the work area

Construction

- Grind the pavement surface areas designated on the plans
- Only grind bridge decks and roadway shoulders when they are indicated on the plans
- Schedule the construction operation to produce a uniform finished surface
- Maintain a constant cross slope between grinding extremities in each lane
- Grind the entire area designated on plans until pavement surfaces of the adjacent sides of the transverse joints and cracks are in the same plane
- Eliminate faulting at the joints and cracks
- Ensure the overall riding characteristics are within the limits specified
- Texture the pavement surface, but do ***not*** grind extra depth to eliminate minor depressions

Payment

- Ground concrete pavement is paid at the Contract Unit Price per square yard (meter)

Georgia Department of Transportation Construction Engineering Inspection Training

Pavements Inspection

Section 432: Mill Asphaltic Concrete Pavement

Delivery, Storage, and Handling

- Uniformly stockpile milled material at the plan locations
- Maintain the existing drainage pattern of water from the stockpile storage area
- Dress the reclaimed asphalt area to drain rainwater from the material
- Obtain the Engineer's approval of the stockpile locations and the method used to prevent milled material degradation, segregation, and reconsolidation

Milling Equipment

Use power-driven, self-propelled milling equipment that is:

- Of the size and shape that allows traffic to pass safely through areas adjacent to the work
- Designed to mill and remove a specified depth of the existing asphalt paving
- Equipped with grade and slope controls operating from a string line or ski and based on mechanical or sonic operation
- Furnished with a lighting system for night work, when necessary

Do not allow dust to restrict visibility of passing traffic or to disrupt adjacent property owners

Stl. Milling and Paving

Milling Operation

- Schedule the construction operation
- Use milling methods that produce a uniform finished surface and maintain a constant cross slope between extremities in each lane
- Provide positive drainage to prevent water accumulation on the milled pavement
- Bevel back longitudinal vertical edges greater than 2 in. (50 mm) that are produced by the removal process and left exposed to traffic
- Remove dust, residue, and loose-milled material from the milled surface
- Do not allow traffic on the milled surface and do not place asphaltic concrete on the milled surface until the removal is complete

Payment

- Milled asphaltic concrete pavement is paid at the Contract Unit Price bid per square yard (meter)

Related Specifications

Section	Title
109	Measurement and Payment

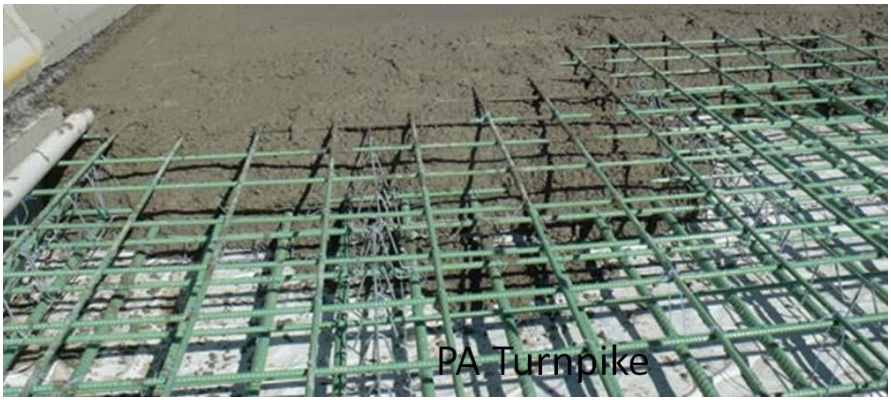
Georgia Department of Transportation Construction Engineering Inspection Training

Pavements Inspection

Section 433: Reinforced Concrete Approach Slabs

Construction

- Construct the approach slab before placing the adjacent roadway paving
- Finish, cure, and protect the approach slab as specified
- Construct curbs of dimensions required monolithic with the approach slab when specified on the plans
- Give the concrete a final finish either manually or mechanically before the concrete has hardened



Payment

- Area measured is paid at the Contract Unit Price per square yard (meter)

Related Specifications

Section	Title
500	Concrete Structures
511	Reinforcement Steel
621	Concrete Barrier
853	Reinforcement and Tensioning Steel

Georgia Department of Transportation Construction Engineering Inspection Training

Pavements Inspection

Section 434: Asphalt Paved Ditches

Required Construction Equipment

- Hand-operated roller
- Small power roller
- Vibratory device
- Hand tampers
- Forms

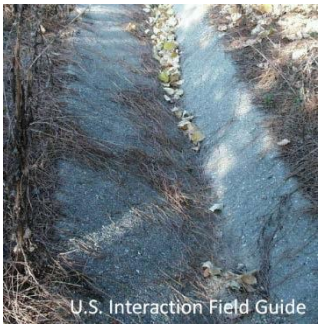
Construction

- Use ditch paving construction methods that allow water to flow continuously
- Protect the ditch paving areas under construction from flowing water, elements, and other disturbances until the materials are fully set

> Keep the ditch unobstructed to prevent ponding or standing water

Subgrade Formation

- Form at the required depth below and parallel to the finished surface of the ditch or waterway
- Remove soft, yielding, or otherwise unsuitable material and replace it with suitable material
- Compact the subgrade to 90% maximum dry density
- Finish the subgrade to a smooth, firm surface
- Place and compact subgrade material to the required thickness



Asphalt Mixture Placement

- Place the mixture within temperature limits of 275°F to 325°F (135°C to 160°C)
- Smooth the mixture by raking or screeding
- Thoroughly compact the mixture
- Compact until the surface is smooth and even and texture is dense and uniform
- Remove the forms, and replace them with compacted backfill
- Shape shoulders and slopes and complete them to conform to the required section

Payment

- Asphalt for ditch paving is paid at the Contract Unit Price per ton (megagram)

Related Specifications

Section	Title
802	Aggregates for Asphaltic Concrete
820	Asphalt Cement
828	Hot Mix Asphaltic Concrete Mixtures

Georgia Department of Transportation Construction Engineering Inspection Training

Pavements Inspection

Section 435: Rapid Setting Cement Concrete End Dams and Patches

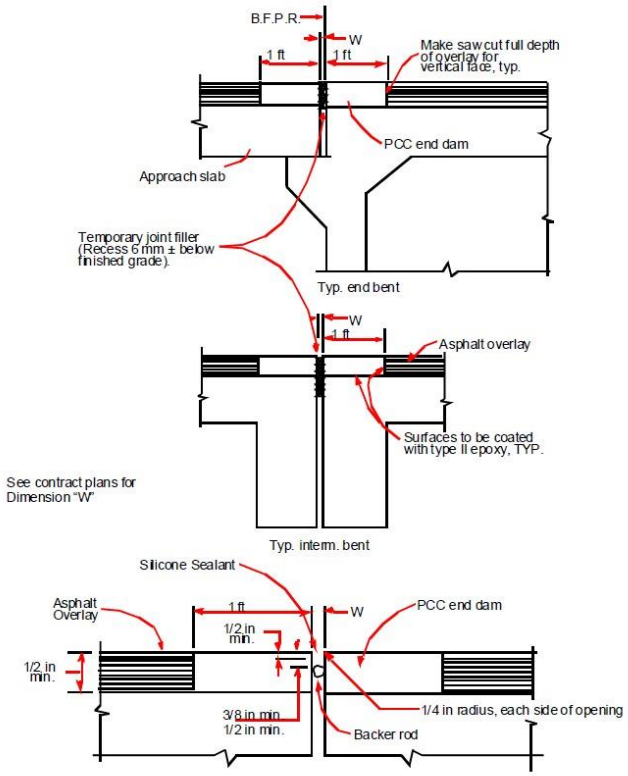
Preparation

- Scarify the surface within the repair area using a concrete scabbler to remove unsound concrete and concrete laitance down to sound coarse aggregate
- Sandblast the surface to remove loose or unsound concrete or other contaminants
- Clean the prepared area with the compressed area
- Completely coat the bottom and vertical side walls of the prepared area with a film of Type II epoxy

> Required minimum depth is 1 in. (25 mm)

Construction

- Repair bridge joint end dams in locations or areas indicated on the plans or designated by the Engineer
- Remove asphaltic concrete from end dams according to the following figure:



Weather Limitations

- Place within a temperature range of 40°F to 100°F (4°C to 38°C)

General Instructions

- Handle, mix, place, and finish rapid-setting cement concrete according to the manufacturer's instructions
- Ensure that the finished rapid-setting cement concrete surface is the same elevation and cross slope as the adjacent pavement
- Deposit rapid-setting cement concrete in the area while the epoxy is still tacky
- Vibrate to completely fill the area of the end dam or patch
- Finish the concrete to the proper grade

Do not allow traffic on end dams or patches until rapid-setting cement concrete obtains a minimum compressive strength of 2500 psi (15 MPa)

Payment

- Joints measured are paid at the Contract Unit Price per cubic ft (m) for bridge joint and end dams, and patches

Related Specifications

Section	Title
500	Concrete Structures
504	Twenty-Four Hour Accelerated Strength Concrete
833	Joint Fillers and Sealers
886	Epoxy Resin Adhesives
934	Rapid Setting Patching Materials for Portland Cement Concrete

Pavements Inspection

Section 436: Asphaltic Concrete Curb

Equipment Requirements

Use an approved self-propelled curbing machine equipped with:

- A hopper
- A power-driven screw
- A mold designed to produce the desired cross section
- The ability to thrust against the asphalt mixture to eliminate objectionable surface voids

Preparation

- Excavate the subgrade for header type curbs to the required depth
- Remove and replace soft or unstable material
- Compact and finish the grade to 90% maximum density
- Shape the subgrade to the required line, grade, and cross section
- Remove dirt and other debris from the area receiving the curb
- Apply tack coat at the rate directed by the Engineer
- Apply tack coat to the full width of the curb being placed
- Place curb sections only after constructing adjoining spillways and drainage outlets

Place curb sections only after constructing adjoining spillways and drainage outlets

Construction

- Determine the working temperature of the asphaltic mixture to achieve the best results
- Do not place curb on an area where the surface temperature is below 40°F (4°C)
- Protect the newly laid curb from traffic by using a barricade or other methods until the mixture has cooled to air temperature
- Once the curb is cool, immediately backfill it

Payment

- Paid at the Contract Unit Price per linear ft (m) for each curb height

Related Specifications

Section	Title
802	Aggregates for Asphaltic Concrete
820	Asphalt Cement

Georgia Department of Transportation Construction Engineering Inspection Training

Pavements Inspection

Section 437: Granite Curb

Preparation

- Thoroughly tamp the bottom of the trench
- Remove soft or yielding material to the depth ordered by the Engineer
- Refill the trench with stable material and tamp the material in 4 in. (100 mm) layers or less
- Place granite curb on a dry, firm foundation

Construction

- Thoroughly ram and maul the curbing into place
- Place and compact backfilling in 4-in. (100 mm) layers or less after setting the curb

> Use backfilling material approved by the Engineer

- Protect the curb by filling 18 in. (450 mm) horizontal strip of backfill dirt behind the curb
- Divert water away from the trench on steep grades or whenever water can enter the trench
- Lower the curb for driveways and alleys as directed
- Cut and round curb sections adjacent to lowered curbs to 45°
- Provide weep holes and drainage openings

Payment

- Granite curb is paid at the Contract Unit Price per linear ft (m) for straight curbs, radial, or curbed curbs

Related Specifications

Section	Title
805	Rip Rap and Curbing Stone

Georgia Department of Transportation Construction Engineering Inspection Training

Pavements Inspection

Section 438: Precast Concrete Header Curb

Construction

- Excavate the subgrade to the required grade and cross section
- Remove unsuitable material in the subgrade and backfill as necessary
- Make the precast header curb in tangent sections only
- Provide dowels or dowel holes in poured-in-place portions for tying in precast sections
- Ensure the precast sections conform to the dimensions and details on the plans

Related Specifications

Section	Title
500	Concrete Structures
853	Reinforcement and Tensioning Steel
866	Precast Concrete Catch Basin, Drop Inlet, and Manhole Units

Pavements Inspection

Section 439: Portland Cement Concrete Pavement (Special)

Required Equipment

- Ramp screeds
- Hand finishing tools
- Scales
- Auxiliary vibrator
- Texturing equipment

Subgrade and Subbase

- Prepare the full width of subgrade and subbase according to the plans and specifications
- Ensure the surface immediately under the concrete pavement allows for proper pavement thickness and yield
- Trim high areas to the proper elevation
- Ensure the subbase can support the paving equipment without rutting or bogging

Setting Forms

- Compact the foundation under forms true to grade
- Set the form so it firmly contacts the foundation for the entire length at the specified grade
- Prevent forms from settling or springing under the finishing machine
- Clean and oil forms before placing the concrete

Concrete Placement

- Unload concrete into an approved spreading device and mechanically spread it on grade
- Place concrete between transverse joints without using intermediate bulkheads
- Perform any necessary hand spreading of concrete with shovels (not rakes)

> Do not allow personnel to walk in freshly mixed concrete with shoes coated with dirt or other materials

- Thoroughly consolidate concrete on both sides of the joint assemblies
- Ensure vibration does not cause grout accumulation on the surface
- Do not use grout that accumulates ahead of the paver for expansion joints
- Deposit the concrete near the formed joints
- Do not dump or discharge concrete on a joint assembly unless the concrete is centered on the joint assembly
- Keep reinforcing steel free of dirt, oil, paint, mill scale, and loose or thick rust that could impair the bond of the steel to the concrete

Consolidation and Finishing

- Perform vibration for the full width and depth of the pavement
- Allow concrete to be smoothed and trued using a hand float

> Protect unhardened concrete from rain

Forms Removal

- Remove forms carefully to avoid damaging the pavement
- Immediately cure the sides of the slab using the same method used to cure the pavement surface
- Remove and replace major honeycombed areas

Joint Construction

- Remove forms carefully to avoid damaging the pavement
- Immediately cure the sides of the slab using the same method used to cure the pavement surface
- Ensure joints are designed, configured, and located as shown on the plans
- Remove and replace plain concrete pavement that cracks during construction
- Seal continuous cracks under movement with sealant
- Saw the vertical face sections to be removed and replace the concrete as a joint with dowels
- Thoroughly clean drilled holes of contaminants and set dowels into the hardened concrete face of the existing pavement
- Uniformly apply a thin coat of heavy grease to epoxy-coated dowels

Joints

Type	Description
Longitudinal	• Shall contain unpainted and uncoated deformed steel bars • Place bars perpendicular to the joint using a mechanical device, or rigidly secure bars in place with supports
Longitudinal Formed	• Construct while the concrete is in a plastic state • Use methods and equipment that locate joint reinforcement properly without disrupting it during construction
Longitudinal Sawed	• Cut with a mechanical saw within 3 days after concrete is placed and before traffic or equipment enters the pavement
Transverse	• Consists of construction joints, contraction joints, or expansion joints constructed at required locations
Construction	• Construct when interrupting concreting operations for more than 1 hour • Do not construct within 10 ft (3 m) of an expansion joint, contraction joint, or transverse plane of weakness

Contraction	• Create planes of weakness in plain portland cement concrete pavement by cutting joints in the pavement surface
Expansion	• Required at location shown on the plans • Furnish and install preformed joint filler in lengths equal to the pavement width or the width of one lane

Cure the entire surface immediately after finishing the concrete

Opening Pavement to Traffic

- Wait to open the pavement slab to traffic until the concrete is 14 days old unless compressive tests show the slab has a compressive strength of 2500 psi (15 MPa)
- Do not allow equipment that exceeds legal load limits on the pavement
- Protect pavement against traffic from the public, employees, and agents

Payment

- Portland cement concrete (special) is paid at the Contract Unit Price per square yard (meter)

Related Specifications

Section	Title
152	Field Laboratory Building
800	Coarse Aggregate
801	Fine Aggregate
830	Portland Cement
831	Admixtures
832	Curing Agents
833	Joint Fillers and Sealers
853	Reinforcement and Tensioning Steel
880	Water
886	Epoxy Resin Adhesives

Georgia Department of Transportation Construction Engineering Inspection Training

Pavements Inspection

Section 440: Plain Portland Cement Concrete Shoulders

Preparation

- Ensure the foundation immediately under the concrete shoulder and areas supporting the paving equipment will not contribute to deficient shoulder thickness or excessive yield losses

Construction

- Deposit concrete on the grade; do not re-handle it if possible
- Unload the concrete into an approved spreading device and mechanically spread it
- Place it continuously between transverse joints without using intermediate bulkheads
- Perform any necessary hand spreading with shovels
- Do not allow personnel to walk in freshly mixed concrete with shoes coated with harmful substances

- Thoroughly consolidate the concrete with vibration against and along the form faces and along the full length and both sides of the joint assemblies
- Do not use grout that accumulates ahead of the paver in construction expansion joints
- Deposit concrete near formed joints
- Do not dump or discharge concrete onto a joint assembly unless the concrete is centered on the joint assembly

Do not allow reinforcement placement to disrupt or damage the concrete

- Vibrate the full width and depth of the shoulder
- Do not allow vibrators to contact the foundation, load transfer devices, side forms, or joints

Concrete Pavement Finishing

- Smooth and true the concrete to the proper cross section with hand floats or mechanical floats
- Ensure the surface conforms to the required cross section and contains no irregular, rough, or porous areas
- Make surfaces flush at the joint between the roadway and the shoulder
- Finish the surface to provide a uniform texture (except on rumble strips)
- Use mechanical equipment for grooving plastic concrete, brooming, or burlap drag

Remove loose material and clean grout from the surface of the adjacent lanes immediately after finishing

Joints

Type	Description
Transverse Contraction	• Saw in shoulder to abut like joints in the roadway
Longitudinal	• Place reinforcement at locations shown on the plans adjacent to the adjoining lane • Secure reinforcement in place with supporting assemblies or by inserting into the supported sides of the fresh concrete
Construction	• From transverse construction joints when concreting operations will be interrupted for more than 1 hour

Permitting Traffic on Shoulders

- Ensure tests show the concrete has developed compressive strength of at least 2000 psi (14 MPa) and is at least 7 days old
- Construct earth ramps to facilitate movement across the shoulder
- Place barricades to prevent traffic encroachment
- Seal joints before permitting vehicles or equipment on the shoulder

Payment

- Concrete shoulders are paid at the Contract Unit Price per square yard (meter)

Related Specifications

Section	Title
500	Concrete Structures
815	Graded Aggregate
830	Portland Cement

Georgia Department of Transportation Construction Engineering Inspection Training

Pavements Inspection

Section 441: Miscellaneous Concrete

Forms

Use forms that:

- Are subject to the Engineer's approval
- Use wood or metal that is readily available
- Are straight and oiled before each use
- Use metal divider plates and templates
- Use a slipform placement method, when applicable

Provide weep hole drain pockets filled with coarse aggregate to use with weep hole drain pipe or formed openings

Subgrade Preparation

- Compact the subgrade to the same degree as the roadway on which it is placed
- The Roadway Contractor shall complete grading for slope paving if required
- Place any required special materials during roadway construction when placing paving on the front slopes of ditches and shoulders
- Do not excavate for velocity dissipators, spillways, and slow drains below the foundation elevation

- Set specified dowel bars into the pavement when it is laid when fitting spillways on the concrete pavement
- Use metal parting strips to hold the ends of dowels bent into grooves

> Do not place concrete on a muddy or frozen surface

Miscellaneous Concrete

Type	Description
Concrete Slope Paving	• Give final finish with a stiff-bristle broom
Concrete Sidewalks	• Give a Type V finish unless otherwise noted • Ensure curb cut (wheelchair) ramps have a rough or textured finish
Concrete Paved Ditches	• Ensure the surface of the bottom and sides of paved ditches are uniform and true to grade and cross section • Do not allow deviation if it reduces the ditch paving thickness • Finish ditch paving by floating with wood or metal floats to bring mortar to the surface to cover the coarse aggregate
Concrete Curbs, Gutters, and Median	• Remove face forms as soon as possible and finish exposed surfaces with a wood float • Use a straightedge to test the edge of the gutter and top of the curb and median • Place using a machine as long as results are satisfactory
Curb Cut Wheelchair Ramps	• Tie ramps into the adjacent paved or unpaved sidewalk and use a rough or textured finish

Slope Paving

- Place paving on slopes in horizontal or vertical courses, but not a mixture of both

Concrete Paved Ditches

- Form joints in concrete paved ditches at 30-ft (9 m) intervals

Concrete Sidewalk

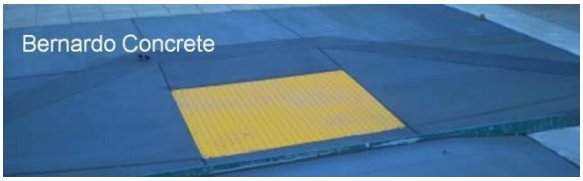
- Form transverse contraction joints using a tool designed to form a groove ⅓ the depth of the sidewalk

Backfilling

- Backfill areas as soon as possible without damaging the work

Clean-Up

- Clean each surface when the concrete work is complete



Payment

- Slope paving, sidewalks, concrete ditches, driveway concrete, drains, and velocity dissipators are all paid at the Contract Unit Price per square yard (meter)
- Concrete headwalls are paid at the Contract Unit Price per cubic yard (meter)
- Curbs, gutters, combination curb and gutters, headers, medians, curb cut wheelchair ramps, and spillways are all paid at the Contract Unit Price per each

Related Specifications

Section	Title
209	Subgrade Construction
500	Concrete Structures
832	Curing Agents
833	Joint Fillers and Sealers
853	Reinforcement and Tensioning Steel

Georgia Department of Transportation Construction Engineering Inspection Training

Pavements Inspection

Section 444: Sawed Joints in Existing Pavement

This work includes sawing of joints in existing Portland cement concrete pavements such as roadway pavements, intersections, driveways, parking areas, and sidewalks when removing existing pavements is shown on the plans or required by the Engineer

Mechanical Saw

- Use an adequately powered, water-cooled, mechanical saw with a diamond-edge blade or an abrasive wheel that will cut in a straight joint to the required depth

Joints

- Saw the joints true to lines designated by the Engineer
- Saw at least 2 in. (50 mm) deep, or deeper if the Engineer directs to remove pavement
- Do not dry saw with abrasive blades (use diamond blades)

Pavement Removal

- Begin removing the pavement
- Protect the edge of pavement that will remain
- Do not use removal methods that may damage these edges

Do not allow traffic or other equipment to cross exposed edge of remaining pavement until new pavement is constructed in its place

Payment

- Sawed joints are paid at the Contract Unit Price per linear ft (m)

Georgia Department of Transportation Construction Engineering Inspection Training

Pavements Inspection

Section 445: Waterproofing Pavement Joints and Cracks

Preparation

- Place bituminous tack coat on:
  - Portland cement concrete
  - Old asphaltic concrete surfaces
- Prime the surface according to the manufacturer's recommendations
- Correct spalls greater than 3 in. (75 mm) in diameter
- Place primer on the surface at the rate specified by the primer manufacturer
- Cover sections that are primed with membrane within the same day or repriming will be required

Membrane Placement

- Place the membrane only when the temperature is above 40°F (4°C) and the pavement surfaces are dry and free of debris
- Center the membranes over the joint or crack within a 2-in. (50 mm) tolerance
- Seal transverse joints and cracks first, starting at the outside edge of the pavement
- Seal longitudinal joints, placing membrane in the direction that the Project will be paved

- Install the membrane straight and wrinkle-free with no curled or uplifted edges
- Press the membrane against the concrete or asphalt surface using a hand roller
- Bond edges and corners of the strips securely to the surface
- Place asphaltic concrete overlay when the membrane surface is dry

Traffic will be allowed to enter the section between the time of placing the membrane and placing the paving, for 7 calendar days (maximum)

- Fill joints or cracks flush with the pavement
- Clean the joint and remove dirt and debris before filling the joint

Payment

- Waterproofing membrane materials are paid at the Contract Unit Price per linear ft (m)

Related Specifications

Section	Title
150	Traffic Control
888	Waterproofing Membrane Materials

Georgia Department of Transportation Construction Engineering Inspection Training

Pavements Inspection

Section 446: Placement of Pavement Reinforcement Fabric

Equipment

- Use a template or other method satisfactory to the Engineer to apply the bituminous tack coat uniformly when using fabric strips
- Use a mechanical device approved by the Engineer when placing fabric full width on the pavement to ensure the fabric is placed smooth, free of wrinkles, and with no uplifted edges
- Place the fabric in total contact with the underlying pavement
- Roll the fabric with a static drum or pneumatic roller to ensure adequate adhesion to the pavement surface

Preparation

- Mark joint and crack locations with an offset reference so they can be located after milling has been completed
- Clean the pavement surface to remove rocks, dirt, debris, and other materials that may prevent a clean bonding surface

Repair potholes, spalls, or cracks greater than $^{3}/_{16}$ in. (5 mm) wide

Construction

- Mark joint and crack locations with an offset reference so they can be located after milling has been completed
- Do not install reinforcement fabric when ambient temperatures are less than 45°F (7°C)
- Use a bituminous tack coat when temperatures are between 45°F (7°C) and 70°F (21°C) for all reinforcement fabric types

- Use bituminous tack coat when fabric is placed on the milled surface, regardless of temperature
- Remove the release liner of the fabric and place the adhesive side to the pavement
- Place the self-adhesive reinforcement fabric no more than 24 hours in advance of the paving operation to ensure proper adhesion of the fabric to the pavement
- Place the fabric on the pavement immediately after the bituminous tack coat is applied to the pavement
- Place the nonwoven polyester side of the fabric on the pavement

Fabric Overlap

- Ensure that seams created butt or are lapped if more than one strip is required
- Make all lapped seams in one direction of the paving operation
- Make joint overlaps to prevent pickup by the paving train that places the asphaltic concrete

Fabric Protection

- Schedule work so that the fabric will be covered with asphaltic concrete prior to reopening the section to traffic
- Do not allow traffic on the unprotected fabric
- Allow traffic to use a section of applied fabric strips for a maximum of 7 days
- Ensure fabric is completely dry before the overlay is placed

Overlay Placement

- Apply bituminous tack coat over the fabric at the rate determined by the Engineer
- Milling may be required to provide minimum thickness (2 in.)

Payment

- Reinforcement fabric is paid at the Contract Unit Price per square yard (meter) or per linear ft (m) of reinforcement fabric

Related Specifications

Section	Title
150	Traffic Control
881	Fabrics

Georgia Department of Transportation Construction Engineering Inspection Training

Pavements Inspection

Section 449: Bridge Deck Joint Seals

Preparation

Issue	Description
Surface Preparation	• Ensure compressed air used to sandblast debris is free of moisture and oil • Use air compressors for cleaning joints equipped with suitable traps capable of removing surplus water and oil • Check compressed air daily for contamination
Preparation for Headers	• Remove loose, eroded, and unsound concrete from the surface within the joint • Provide horizontal bonding areas by cutting angular areas of concrete blockouts • Sandblast concrete surfaces or abrade free of oil, dust, dirt, traces of asphaltic concrete, or other contaminants
Preparation for Joint Seal	• If necessary, use a saw-cut concrete deck to provide an acceptable attachment surface for the joint seal
Joint Fabrication	• Have the joint fabricated the full width of the bridge deck

Construction

- Use an installer trained by the manufacturer to install the bridge deck joint sealing system
- Ensure the surface is completely dry before applying adhesive or primer
- Ambient temperature must not be less than 55°F (13°C) during installation of the epoxy concrete material

> Do not perform any part of installation in rainy weather or when rain is expected within 1 hour of installation

Handling, Mixing, Finishing, and Curing

- Fill blockout to the correct grade
- Cure the material according to the manufacturer's instructions
- Thoroughly mix the resin and hardener of epoxy mortar
- Prime the surface of the concrete in accordance with the manufacturer's recommendations
- Place and finish epoxy concrete within ½ hour of mixing

Preformed Elastomeric Neoprene Profile Joint Seal Application

- Remove the temporary joint filler and thoroughly clean the joint faces of all joint filler
- Lightly sandblast the joint to remove all residue
- Apply adhesive according to the manufacturer's recommendations
- Promptly remove all surplus residue on the bridge deck

Do not permit traffic to drive over sealed joints until epoxy or elastomeric concrete has hardened enough to resist displacement. Allow epoxy concrete to cure for at least 2 hours before opening to traffic

Payment

- When listed as a pay item in the Proposal, Bridge deck joint seal is paid at the Contract Price per linear ft (m)

Related Specifications

Section	Title
106	Control of Materials
501	Steel Structures
ASTM	A 36
ASTM	D 395
ASTM	D 570
ASTM	D 588
ASTM	D 624
ASTM	D 638
ASTM	D 1299
ASTM	D 2240
ASTM	D 2628
ASTM	D 4070

Pavements Inspection

Section 450: Pressure Grouting Portland Cement Concrete Pavement

This work includes pumping a slurry type grout mixture through holes drilled in the pavement into voids underneath the slabs to stabilize and underseal the Portland cement concrete pavement.

Equipment

Type	Description
Batching Equipment	• Includes weight hoppers and scales for each dry material or calibrated volumetric batch hopper • Equip conveyor belts with windproof covers if belts convey dry materials into the mixer
Mixing Equipment	• Use a watertight, batch-type mixer or high-speed colloidal mixer capable of blending materials into a homogeneous mixture • Use a high-speed colloidal mixer various mix types
Grout Pumping Equipment	• Use grout pumping equipment with a positive displacement plunger or piston-type pump or a screw-type worm pump • Equip the end of the discharge line with a nozzle or device that remains secure in the drilled holes and is free of leaks • Furnish a blow pipe with enough air pressure to dislodge loose debris • Provide an auger of proper size and length to open clogged holes
Drilling Equipment	• Provide air compressors with enough capacity to operate pneumatic hammers or drills • Provide pneumatic or hydraulic drills equipped with bits • Operate equipment so as to prevent damage to the pavement being drilled • Do not create excessive down pressure to force the bit through the concrete rapidly
Slab Stabilization Testing Equipment	• Furnish a two-axle truck with dual rear wheels • Load rear axle to evenly distribute between the two sides
Slab Lift Measuring Equipment	• Ensure the equipment used to measure the slab lift can simultaneously detect movement of the two outside slab corners adjacent to the joint and the adjoining shoulder

Begin grouting operations when the air temperature in the shade is at least 35°F and rising

Drilling Holes

- Use the hole pattern and pumping sequence shown on the plans with modifications to use as many holes from previous undersealing work as possible
- The Engineer may alter the hole pattern
- Drill holes 1½ in. (38 mm) in diameter or another size if approved by the Engineer
- Ensure holes provide a positive seal for the pumping nozzle
- Drill holes approximately 8 in. (200 mm) deep beneath the bottom of the concrete
- Be careful during operations to not break or crack the slabs
- Repair slabs that have cracks that extend through the drill hole

Insert a pipe with enough air pressure in each hole to remove debris and provide passage for grout

Underseal Grout Pumping

- Pump grout holes designated by the Engineer
- Have the Engineer determine the time of day to perform pressure grouting
- The Engineer may require pressure grouting during late night and early morning hours
- Watch the lift measuring device to prevent excessive pumping pressures, rapid lifting of slabs, or substantial rising of adjacent shoulders
- Stop pumping in the hole when cavities or voids are filled within the range of the hole being grouted

Do not crack the slabs by differential lifting

- Secure the discharge hose nozzle in the hole to provide a seal that will maintain grout pressure underneath the slab
- Continue pumping in the hole until a clear flow of grout comes out the other holes, joints, or cracks, or until the slab begins to lift excessively
- Repeat this procedure in other holes until voids are filled
- Take precautions to minimize the amount of grout that flows into the edgedrain system

Traffic Note: Do not permit traffic on grouted slabs until the grout has taken an initial set (4–6 hours)

Payment

Type	Payment Method
Holes	Contract Until Price per each
Portland Cement Pressure Grout Slurry	Contract Unit Price bid per 94-lb (42.6 kg) bag of cement
Preliminary Testing	Contract Price bid per linear mile (kilometer) horizontal measure

Related Specifications

Section	Title
609	Removal of Portland Cement Concrete Roadway Slabs
801	Fine Aggregate
830	Portland Cement
831	Admixtures
880	Water
882	Lime
883	Mineral Filler
884	Chlorides

Pavements Inspection

Section 451: Patching Portland Cement Concrete Pavement (Spall Repair)

Equipment

- Use air compressors equipped with traps that can remove surplus water and oil in compressed air
- Ensure the compressor can deliver compressed air at a continuous pressure
- Do not use contaminated air

Repair Area Removal and Preparation

- "Sound" each transverse joint and longitudinal joint with a visual defect to determine the limits of damaged or defective areas
- Strike the pavement surface along the sides of each joint with a hammer, chair drag, or similar tool to detect unsound concrete that sounds flat or hollow
- Mark the limits of defective areas on pavement by marking 2 in. (50 mm) beyond the outer limits of unsound concrete area

- Mark spalled areas less than 2 ft (600 mm) from each other along a joint as one spall area
- Remove unsound material within the sawed area using a chipping hammer
- Before placing patching material, saw the face of existing transverse or longitudinal joints bordering the repair areas
- Thoroughly clean surfaces within repair areas by sandblasting and air blasting to remove oil, dust, dirt, traces of asphaltic concrete, slurry from saw operation, and other contaminants

Do not "over-cut" pavement beyond marked areas, whenever possible

Concrete Patching

- Accomplish the work with other operations in progress within an area if possible
- Complete the work before grinding operations begin
- Remove and replace completed concrete patches that contain cracks, shrinkage, or compression failures

Repair Method 1: 24-hour Accelerated Strength Concrete

- Completely coat concrete surface areas within the repair area with a film of Type II epoxy
- Mix the concrete on site in a portable mixer
- Deposit the concrete in the repair area while the epoxy is still tacky
- Vibrate it to form a dense, homogeneous mass of concrete that completely fills the patch
- Screed the concrete to the proper grade and do not disturb it until the water sheen disappears from the surface
- Cover the concrete with wet burlap or membrane-curing compound

Repair Method 2: Rapid Setting Patching Material for Portland Cement Concrete

- Perform patching material handling, mixing, placing, consolidating, screeding, and curing according to the manufacturer's instructions
- Continue curing for 1 hour (minimum) and until opening the section to traffic

Special Requirements

- Place a form to the full depth of the repair area to maintain a true, straight shoulder joint
- Protect traffic in adjacent lanes during sandblasting
- Thoroughly clean the area to be repaired with compressed air

- Remove sand from the sandblasting operation from the roadway and shoulders
- Remove saw slurry and other contaminants from over-cutting

Payment

- Spall repair is paid at the Contract Unit Price per square yard (meter)

Related Specifications

Section	Title
504	Twenty-Four Hour Accelerated Strength Concrete
800	Coarse Aggregate
801	Fine Aggregate
833	Joint Fillers and Sealers
886	Epoxy Resin Adhesives
934	Rapid Setting Patching Materials for Portland Cement Concrete

Georgia Department of Transportation Construction Engineering Inspection Training

Pavements Inspection

Section 452: Full Depth Slab Replacement

Preparation

- Use wire brushes or other methods to clean exposed faces
- Remove existing silicone or other joint sealant from exposed concrete faces
- Remove debris and standing water from the base
- Thoroughly compact loose base material by hand tamping before placing concrete

Dowel Installation

- Use a pneumatic or hydraulic drill to drill holes into the existing concrete faces
- Drill a hole no greater than 1½ in. (38 mm) diameter to insert dowel bars
- Prevent damage to the pavement being drilled
- Thoroughly clean drilled holes of contaminants
- Set the type and size of dowels into hardened concrete face from existing pavement with Type VIII epoxy bonding compound
- Place dowels with one-half of the dowel protruding out of the pavement
- Place dowels at the correct horizontal and vertical alignment
- Place enough epoxy in the back of the hole to completely fill the entire cavity around the dowel
- Allow epoxy to harden before placing concrete to prevent the dowels from moving

Never drive dowels into the dowel hole with a sledge hammer or other device

Setting Forms

- Place the form the full depth of the replaced slab or joint area to maintain a true, straight shoulder joint
- Compact the foundation under the form true to grade
- Clean and oil the forms before placing the concrete
- Wait 4 hours to remove the forms from the freshly placed concrete
- Carefully remove forms to avoid damaging the pavement
- Repair the shoulder to the Engineer's satisfaction

Coated dowels will be rejected if they cannot be freely inserted into a dowel hole

Concrete Placement and Finishing

- Deposit concrete within the slab replacement area in a way that requires as little rehandling as possible
- Minimize hand spreading as much as possible

Do not allow workmen to walk in fresh concrete with shoes coated with earth or other foreign substances

- Fill the replaced slab area with concrete and thoroughly consolidate by rodding, spading, and using vibration to form a dense homogeneous mass throughout the area
- Ensure the final surface area has a uniform appearance and is free of irregularities and porous areas

Sawing and Sealing Joints

- Saw and seal joints with silicone sealant
- Ensure the width of the sawed joints is ⅜ in. (10 mm)
- Saw and seal joints as soon as possible, but not more than 60 days after placing the slab

Rain Protection

- Keep materials to protect the concrete surface available at all times
- When rain in imminent, stop paving operations and begin covering the surface of the unhardened concrete with a protective covering

> Provide lighting for work performed at night for safety, traffic control, and work control and completion

Opening to Traffic

- Schedule slab replacements so that concrete will cure for 4 hours (minimum)
- Complete the work and open the lanes to traffic before sunset

Payment

- Slab replacement is paid at the Contract Unit Price per cubic yard (meter)

Related Specifications

Section	Title
504	Twenty-Four Hour Accelerated Strength Concrete
609	Removal of Portland Cement Concrete Roadway Slabs
833	Joint Fillers and Sealers
853	Reinforcement and Tensioning Steel
886	Epoxy Resin Adhesives

Georgia Department of Transportation Construction Engineering Inspection Training

Pavements Inspection

Section 455: Filter Fabric for Embankment Stabilization

Preparation

- Prior to placing filter fabric, remove logs, stumps, and other objects from the ground surface
- Leave grasses that formed root mats in place to provide support for the fabric placement

Georgia Department of Transportation Construction Engineering Inspection Training

Pavements Inspection

Section 456: Indentation Rumble Strips

Definitions

Skip Ground-In-Place Rumble Strips:	Rumble strips placed with 28 ft (8.5 m) of strips and 12 ft (3.7 m) of clear space between
Continuous Ground-In-Place Rumble Strips:	Rumble strips placed continuously
Edge Line Rumble Strips:	Rumble strips placed continuously on the edge-line traffic stripe
Centerline Rumble Strips:	Rumble strips placed continuously on the centerline traffic striping

Cutting Tool

Use a cutting tool that:

- Has independent suspension from the power unit to allow the tool to self-align with the slope of the shoulder
- Is equipped with guides to provide consistent alignment of each line of indentations in relation to the roadway
- Houses a single rotary-type milling/grinding head in line in the direction of travel

Indentations

- Install indentations within 10 calendar days for traveled ways opened to traffic
- Ensure finished indentations have a concave circular shape and are spaced 12 in. (300 mm) center to center

Excess waste material resulting from operation may be swept to grassed shoulder and spread where applicable

Payment

- Rumble strips are paid at the Contract Unit Price bid per gross linear mile (kilometer)

Pavements Inspection

Section 461: Sealing Roadway and Bridge Joints and Cracks

Equipment

Type	Description
Air Compressors	• Equipped with traps to remove surplus water and oil in compressed air • Do not use contaminated air • Ensure the compressor can deliver compressed air at a continuous pressure
Silicone Sealant Pump	• Apply silicone by pumping only • Use a caulking gun with cartridge for touch-up work or small applications • Use a pump with sufficient capacity to deliver the necessary volume of silicone to completely fill the joint in a single pass
Caulking Gun	• Use for touch up work • Use to place vertical runs of Type A silicone in the bridge deck joint when Type B, C, or D silicone is used in horizontal runs • Seal voids and cracks with Type A silicone • Use for sealing small cracks in concrete

Ensure joint is clean and dry before installing a bond breaker or sealant

Resealing Existing Joints

- Remove existing sealant in joints
- Determine the depth of existing joint
- Thoroughly clean the joint of all foreign material

Sealing New Joints

- Saw transverse and longitudinal joints
- Make the initial cut and wait for the concrete to harden enough to prevent spalling or raveling
- Make the second cut to the required width and depth
- Clean the freshly cut sawed joints
- Install bond breakers
- Install silicone sealant
- Clean the pavement
- Open to traffic

The Engineer will determine all cracks that should be resealed

Payment

- Sealed joints are paid at the Contract Unit Price bid per linear ft (m)

Related Specifications

Section	Title
500	Concrete Structures
833	Joint Fillers and Sealers
886	Epoxy Resin Adhesives

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